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Kevin D. Kohl

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RESEARCH INTERESTS

Digestive physiology, nutritional ecology, and symbiotic relationships between hosts and gut microbes in terrestrial vertebrates

EDUCATION, TRAINING, AND EMPLOYMENT

Assistant Professor – 2017 – Present

University of Pittsburgh, Department of Biological Sciences

Postdoctoral Researcher - 2014 – 2017

Vanderbilt University

Co-advisor: Dr. Seth Bordenstein

Universidad Nacional de San Luis

Co-advisor: Dr. Enrique Caviedes-Vidal

Doctor of Philosophy, Biology - 2014

University of Utah

Advisor: Dr. Denise Dearing

Bachelor of Science, Biology and Wildlife Ecology - 2009

University of Wisconsin – Madison

Graduated with Honors in Research

GRANTS, AWARDS, AND HONORS

University of Pittsburgh Central Research Development Fund (2019)

“Can we learn from the past?: Validating the use of museum specimens to study the gut microbiome”

Total Costs: \$16,000

Morris Animal Foundation (2019)

“Impact of Artificial Rearing on the Microbiota and Health of Endangered Whooping Cranes

Total Costs: \$126,587

University of Pittsburgh Central Research Development Fund (2018)

“Developing an Experimental System to Investigate Microbial Contributions to Host Physiology”

Total Costs: \$16,000

Winters Foundation (2018)

“Molecular Mechanisms Controlling Assembly of the Gut Microbiota In Early Life”

Total Costs: \$10,000

NIH T32 Training Grant in Gastroenterology (2016)

“Genetic mechanisms underlying development of the gut microbiome”

Total Costs: \$47,000

NSF Conference, Symposia, and Workshop Support (2016)

“Meeting: Microbial Partners in Integrative and Comparative Biology, a Symposium for the Society for Integrative and Comparative Biology (SICB)”

Total Costs: \$12,450

NSF International Postdoctoral Research Fellowship in Biology (2014)

“The role of maternal transmission of the gut microbiota in stabilizing host-microbe interactions and facilitating co-evolution”

Total Costs: \$140,000

G. Richard Riser Award for Outstanding Graduate Research (2014)

University of Utah - Department of Biology

NSF Doctoral Dissertation Improvement Grant (2012)

“Biodiversity and community ecology of the gut microbiota in herbivores with respect to dietary toxins”

Total Costs: \$14,999

Best Student Oral Presentation (2011)

Division of Comparative Physiology and Biochemistry
Society for Integrative and Comparative Biology Meeting, Salt Lake City, UT

NSF Graduate Research Fellowship Award (2010)

"Investigating the role of intestinal microbes in the metabolism of plant toxins"
Total Costs: \$125,500

American Museum of Natural History Theodore Roosevelt Memorial Grant (2010)

Total Costs: \$2000

Southwest Association of Naturalists Howard McCarley Research Award (2010)

Total Costs: \$1000

Society for Integrative and Comparative Biology Grant in Aid of Research (2010)

Total Costs: \$1000

TEACHING

***Environmental Animal Physiology* – BioSci 1435 (3 cr) – Univ. of Pittsburgh**

Instructor – Spring 2019

Mammalogy - Biology 5370 (3 cr) – Univ. of Utah

Instructor – Spring 2012, Spring 2013

PUBLICATIONS

Google Scholar Page: www.tinyurl.com/KohlGoogleScholar

62. Martínez-Mota, R., **Kohl, K.D.**, Orr, T.J., Dearing, M.D. (2019) Natural diets promote retention of the native gut microbiota in captive rodents. *ISME Journal*. Accepted.
61. Dheilly, N.M., Martínez Martínez, J., Rosario, K., Brindley, P.J., Fichorova, R.N., Kaye, J.Z., **Kohl, K.D.**, Knoll, L.J., Lukeš, J., Perkins, S.L., Poulin, R., Schriml, L., Thompson, L.R. (2019) Parasite microbiome project: Grand Challenges. *PLoS Pathogens*. 15: e1008028.
60. Trevelline, B.K., MacLeod, K.J., Langkilde, T., **Kohl, K.D.** (2019) Gestation alters the gut microbiota of an oviparous lizard. *FEMS Microbiology Ecology*. 95: fiz086.
59. Marón, C.F., **Kohl, K.D.**, Chirife, A., Di Martino, M., Penadés Fons, M., Navarro, M.A., Beingesser, J., McAloose, D., Uzal, F., Dearing, M.D., Rowntree, V.J., Uhart, M. (2019) Symbiotic microbes and potential pathogens in the intestine of stranded southern right whale calves (*Eubalaena australis*). *Anaerobe*. 57: 107-114.
58. Trevelline, B.K., Fontaine, S.S., Hartup, B.K., **Kohl, K.D.** (2019) Conservation biology needs a microbial renaissance: a call for the consideration of host-associated microbiota in wildlife management practices. *Proceedings of the Royal Society B: Biological Sciences*. 286: 20182448.
57. **Kohl, K.D.**, Brun, A., Caviedes-Vidal, E., Karasov, W.H. (2019) Age-related changes in the gut microbiota of wild House Sparrow nestlings. *Ibis*. 161: 184-191.
56. Li, G., Li, J., **Kohl, K.D.**, Yin, B., Wei, W., Wan, X., Xu, B., Zhang, Z. (2019) Dietary shifts influenced by livestock grazing shape the gut microbiota composition and co-occurrence networks in a local rodent species. *Journal of Animal Ecology*. 88: 302-314.
55. Fontaine, S.S., Navarro, A.J., **Kohl, K.D.** (2018) Environmental temperature alters the digestive performance and gut microbiota of a terrestrial amphibian. *Journal of Experimental Biology*. 221: 187559.
54. **Kohl, K.D.**, Oakeson, K.F., Orr, T.J., Miller, A.W., Forbey, J.S., Phillips, C.D., Dale, C., Weiss, R.B., Dearing, M.D. (2018) Metagenomic sequencing provides insights into microbial detoxification in the guts of small mammalian herbivores (*Neotoma* spp.). *FEMS Microbiology Letters*. 94: fiy184.
53. Forbey, J.S., Liu, R., Caughlin, T.T., Matocq, M.D., Vucetich, J.A., **Kohl, K.D.**, Dearing, M.D., Felton, A.M. (2018) Using physiologically-based models to predict population responses to phytochemicals by wild vertebrate herbivores. *Animal*. 12: s383-s398.

52. Nadkarni, N.M., **Kohl, K.D.** (2018) Elements of disturbance that affect epiphyte vitality in a temperate rainforest: an experimental approach. *Journal of Plant Ecology*. Online Ahead of Print.
51. Trevelline, B.K., MacLeod, K.J., Knutie, S.A., Langkilde, T., **Kohl, K.D.** (2018) *In ovo* microbial communities: a potential mechanism for the initial acquisition of gut microbiota among oviparous vertebrates. *Biology Letters*. 14: 20180225.
50. Wiebler, J.M., **Kohl, K.D.**, Lee, R.E., Costanzo, J.P. (2018) Urea hydrolysis by gut bacteria in a hibernating frog: Evidence for urea-nitrogen recycling in Amphibia. *Proceedings of the Royal Society B: Biological Sciences*. 285: 20180241.
49. **Kohl, K.D.** (2018) A microbial perspective on the 'Grand Challenges in Comparative Animal Physiology'. *mSystems*. 3: e00146-17.
48. **Kohl, K.D.**, Dearing, M.D., Bordenstein, S.R. (2018) Microbial communities exhibit host-species distinguishability and phyllosymbiosis along the length of the gastrointestinal tract. *Molecular Ecology*. 27: 1874-1883.
47. **Kohl, K.D.**, Brun, A., Bordenstein, S.R., Caviedes-Vidal, E., Karasov, W.H. (2018) Gut microbes limit growth in House Sparrow nestlings (*Passer domesticus*), but not through limitation in digestive capacity. *Integrative Zoology*. 13: 139-151.
46. Knutie, S.A., Gabor, C., **Kohl, K.D.**, Rohr, J.R. (2018) Do host-associated gut microbiota mediate the effect of an herbicide on disease risk in frogs? *Journal of Animal Ecology*. 87: 489-499.
45. **Kohl, K.D.**, Varner, J., Wilkening, J.L., Dearing, M.D. (2018) Gut microbial communities of American pikas (*Ochotona princeps*): evidence for phyllosymbiosis and adaptations to novel diets. *Journal of Animal Ecology*. 87: 323-330.
44. **Kohl, K.D.**, Oakeson, K., Dunn, D., Meyerholz, D.K., Dale, C., Weiss, R.B., Dearing, M.D. (2017) Patterns of host gene expression associated with harboring a foregut microbial community. *BMC Genomics*. 18:697.
43. Knutie, S.A., Wilkinson, C.L., **Kohl, K.D.**, Rohr, J.R. (2017) Early-life disruption of amphibian microbiota decreases later-life resistance to parasites. *Nature Communications*. 8: 86.
42. **Kohl, K.D.**, Dearing, M.D. (2017) With a little help from my friends: Microbial partners in integrative and comparative biology. *Integrative and Comparative Biology*. 57: 669-673.
41. Knutie, S.A., Shea, L.A., Kupselaitis, M., Wilkinson, C.L., **Kohl, K.D.**, Rohr, J.R. (2017) Early-life diet affects host microbiota and later-life defenses against parasites in frogs. *Integrative and Comparative Biology*. 57: 732-742.
40. **Kohl, K.D.** (2017) An introductory 'how-to' guide for incorporating microbiome research into integrative and comparative biology. *Integrative and Comparative Biology*. 57: 674-681.
39. Dearing, M.D., **Kohl, K.D.** (2017) Beyond Fermentation: Other important services provided to endothermic herbivores by their gut microbiota. *Integrative and Comparative Biology*. 57: 723-731.
38. **Kohl, K.D.**, Dearing, M.D. (2017) Intestinal lymphatic transport: an overlooked pathway for understanding absorption of plant secondary compounds in vertebrate herbivores. *Journal of Chemical Ecology*. 43: 290-294.
37. **Kohl, K.D.**, Brun, A., Magallanes, M., Brinkerhoff, J.D., Laspiur, A., Acosta, J.C., Caviedes-Vidal, E., Bordenstein, S.R. (2017) Gut microbial ecology of lizards: insights into diversity in the wild, effects of captivity, variation across gut regions, and transmission. *Molecular Ecology*. 26: 1175-1189.
36. Brooks, A.W.[‡], **Kohl, K.D.**[‡], Brucker, R.M.[‡], van Opstal, E., Bordenstein, S.R. (2016) Phyllosymbiosis: relationships and functional effects of microbial communities across host evolutionary history. *PLoS Biology*. 14: e2000225. ([‡]Co-first authors)
 - Profiled by *The Scientist* – www.tinyurl.com/Phyllosymbiosis
35. **Kohl, K.D.**, Carey, H.V. (2016) A place for host-microbe symbiosis in the comparative physiologist's toolbox. *Journal of Experimental Biology*. 219: 3496-3504.
34. **Kohl, K.D.**, Ciminari, M.E., Chediack, J.G., Leafloor, J.O., Karasov, W.H., McWilliams, S.R., Caviedes-Vidal, E. (2016) Modulation of digestive enzyme activities in the avian digestive tract in relation to diet composition and quality. *Journal of Comparative Physiology – B*. 187: 339-351.

33. Kohl, K.D., Dearing, M.D. (2016) The woodrat gut microbiota as an experimental system for understanding microbial metabolism of dietary toxins. *Frontiers in Microbiology*. 7: 1165.
32. Kohl, K.D., Connelly, J.W., Dearing, M.D., Forbey, J.S. (2016) Microbial detoxification in the gut of a specialist avian herbivore, the Greater Sage-Grouse. *FEMS Microbiology Letters*. 363: fnw144.
31. Kohl, K.D., Brun, A., Magallanes, M., Brinkerhoff, J.D., Laspiur, A., Acosta, J.C., Bordenstein, S.R., Caviedes-Vidal, E. (2016) Physiological and microbial adjustments allow facultative herbivory in an omnivorous lizard. *Journal of Experimental Biology*. 219: 1903-1912.
 - Profiled by Science – www.tinyurl.com/KohlLizardGuts
30. Kohl, K.D., Sadowska, E.T., Rudolf, A., Dearing, M.D., Koteja, P. (2016) Experimental evolution on a wild mammal species results in modification of gut microbial communities. *Frontiers in Microbiology*. 7: 634
29. Kohl, K.D., Yahn, J. (2016) Effects of environmental temperature on the gut microbial communities of tadpoles. *Environmental Microbiology*. 18: 1561-1565.
28. Kohl, K.D., Samuni-Blank, M., Izhaki, I., Gerchman, Y., Lymberakis, P., Kurnath, P., Arad, Z., Karasov, W.H., Dearing, M.D. (2016) Effects of fruit toxins on intestinal and microbial β -glucosidase activities of seed-predating and seed-dispersing rodents (*Acomys* spp.). *Physiological and Biochemical Zoology*. 89: 198-205.
27. Kohl, K.D., Stengel, A., Dearing, M.D. (2016) Inoculation of tannin-degrading bacteria into novel hosts increases performance on tannin-rich diets. *Environmental Microbiology*. 18: 1720-1729.
26. Skopec, M.M., Kohl, K.D., Schramm, K., Halpert, J.R., Dearing, M.D. (2015) Using the specialization framework to determine the degree of dietary specialization in a herbivorous woodrat. *Journal of Chemical Ecology*. 41: 1059-1068.
25. Kohl, K.D., Coogan, S.C.P., Raubenheimer, D. (2015) Do wild carnivores forage for prey or for nutrients?: Evidence for nutrient specific foraging in vertebrate predators. *BioEssays*. 37: 701-709.
24. Chalmers, J.W., Mock, K.E., Kohl, K.D., Madsen, K.J., Nadkarni, N.M. (2015) Clonality and dynamics of leaf abscission of Gambel oaks at small spatial scales in Utah. *Forest Science*. 61: 829-833.
23. Kohl, K.D., Luong, K., Dearing, M.D. (2015) Validating the use of trap-collected feces for studying the gut microbiome of a small mammal (*Neotoma lepida*). *Journal of Mammalogy*. 96: 90-93.
22. Kohl, K.D., Cary, T.L., Karasov, W.H., Dearing, M.D. (2015) Larval exposure to polychlorinated biphenyl 126 (PCB-126) causes persistent alteration of the amphibian gut microbiota. *Environmental Toxicology and Chemistry*. 34: 1113-1118.
21. Kohl, K.D., Pitman, E., Robb, B.C., Connelly, J.W., Dearing, M.D., Forbey, J.S. (2015) Monoterpenes as inhibitors of digestive enzymes and counter-adaptations in a specialist avian herbivore. *Journal of Comparative Physiology – B*. 185: 425-434.
20. Kohl, K.D., Miller, A.W., Dearing, M.D. (2015) Evolutionary irony: evidence that “defensive” plant spines act as a proximate cue to attract a mammalian herbivore. *Oikos*. 124: 835-841.
 - Profiled on New Scientist – www.tinyurl.com/KohlCactus
19. Kohl, K.D., Marón, C.F., Chirife, A., Di Martino, M., Dearing, M.D., Rowntree, V.J. (2015) Intestinal lactase activity in southern right whale calves (*Eubalaena australis*). *Marine Mammal Science*. 31: 398-403.
18. Kohl, K.D., Amaya, J., Passemment, C.A., Dearing, M.D., McCue, M.D. (2014) Unique and shared responses of the gut microbiota to prolonged fasting: a comparative study across five classes of vertebrate hosts. *FEMS Microbiology Ecology*. 90: 883-894.
17. Kohl, K.D., Weiss, R.B., Cox, J., Dale, C., Dearing, M.D. (2014) Gut microbes of mammalian herbivores facilitate intake of plant toxins. *Ecology Letters*. 17: 1238-1247.
 - Science Editor’s Choice article
 - Profiled on National Geographic – www.tinyurl.com/KohlWoodrat
 - Featured in popular science book “*I Contain Multitudes*” by Ed Yong
16. Kohl, K.D., Miller, A.W., Marvin, J.E., Mackie, R., Dearing, M.D. (2014) Herbivorous rodents (*Neotoma* spp.) harbor abundant and active foregut microbiota. *Environmental Microbiology*. 16: 2869-2878.

15. Kohl, K.D., Skopec, M.M., Dearing, M.D. (2014) Captivity results in disparate loss of gut microbial diversity in closely related hosts. *Conservation Physiology*. 2: cou009.
14. Miller, A.W., Kohl, K.D., Dearing, M.D. (2014) The gastrointestinal tract of the white-throated woodrat (*Neotoma albigula*) harbors distinct consortia of oxalate-degrading bacteria. *Applied and Environmental Microbiology*. 80: 1595-1601.
13. Kohl, K.D., Dearing, M.D. (2014) Wild-caught rodents retain a majority of their natural gut microbiota upon entrance into captivity. *Environmental Microbiology Reports*. 6: 191-195.
12. Brzęk, P., Kohl, K.D., Caviedes-Vidal, E., Karasov, W.H. (2013) Activity of intestinal carbohydrases responds to multiple dietary signals in nestling House sparrows. *Journal of Experimental Biology*. 216: 3981-3987.
11. Kohl, K.D., Cary, T.L., Karasov, W.H., Dearing, M.D. (2013) Restructuring of the amphibian gut microbiota through metamorphosis. *Environmental Microbiology Reports*. 5: 899-903.
10. Samuni-Blank, M., Izhaki, I., Dearing, M.D., Karasov, W.H., Gerchman, Y., Kohl, K.D., Lymberakis, P., Kurnath, P., Arad, Z. (2013) Physiological and behavioural effects of fruit toxins on seed-predating versus seed-dispersing congeneric rodents. *Journal of Experimental Biology*. 216: 3667-3673.
9. Kohl, K.D., Stengel, A., Samuni-Blank, M., Dearing, M.D. (2013) Effects of anatomy and diet on gastrointestinal pH in rodents. *Journal of Experimental Zoology Part A*. 319:225-229.
8. Brzęk, P., Ciminari, M.E., Kohl, K.D., Lessner, K., Karasov, W.H., Caviedes-Vidal, E. (2013) Effect of age and diet composition on activity of pancreatic enzymes in birds. *Journal of Comparative Physiology - B*. 183:685-697.
7. Kohl, K.D., Dearing, M.D. (2012) Experience matters: prior exposure to plant toxins enhances diversity of gut microbes in herbivores. *Ecology Letters*. 15:1008-1015.
6. Kohl, K.D. (2012) Diversity and function of the avian gut microbiota. *Journal of Comparative Physiology B*. 182:591-602.
5. Kohl, K.D., Dearing, M.D. (2011) Induced and constitutive responses of digestive enzymes to plant toxins in an herbivorous mammal. *Journal of Experimental Biology*. 214:4133-4140.
4. Kohl, K.D., Weiss, R.B., Dale, C., Dearing, M.D. (2011) Diversity and novelty of the gut microbial community of an herbivorous rodent (*Neotoma bryanti*). *Symbiosis*. 54:47-54.
3. Brzęk, P., Kohl, K.D., Caviedes-Vidal, E., Karasov, W.H. (2011) Fully reversible phenotypic plasticity of digestive physiology in young House sparrows: lack of long-term effect of early diet composition. *Journal of Experimental Biology*. 214:2755-2760.
2. Kohl, K.D., Brzęk, P., Caviedes-Vidal, E., Karasov, W.H. (2011) Pancreatic and intestinal carbohydrases are matched to dietary starch level in wild passerine birds. *Physiological and Biochemical Zoology*. 84:195-203.
1. Brzęk, P., Kohl, K.D., Caviedes-Vidal, E., Karasov, W.H. (2009) Developmental adjustments of House sparrow (*Passer domesticus*) nestlings to diet composition. *Journal of Experimental Biology*. 212:1284-1293.

INVITED PRESENTATIONS

- 2020 University of Texas at Arlington, Arlington, TX
- 2020 Auburn University, Auburn, AL
- 2019 University of Rhode Island, Providence, RI
- 2019 Jagiellonian University, Kraków, Poland
- 2019 Muséum National d'Histoire Naturelle, Paris, France
- 2019 Invited Speaker to symposium "Meals, Metabolism, Microbes, and Management: Linking Foraging Behavior and Physiology to Predict Demographics in Wildlife". Annual meeting of The Wildlife Society in Reno, NV
- 2019 The Ohio State University, Columbus, OH
- 2019 West Virginia University, Morgantown, WV
- 2019 Invited to participate in 'Parasite Microbiome Project Workshop', Clearwater, FL
- 2018 University of California – Irvine, CA
- 2018 University of Connecticut, Storrs, CT

- 2018 Plenary speaker at Duquesne Biology Department Retreat, Pittsburgh, PA
- 2017 Pennsylvania State University, State College, PA
- 2017 University of Alabama, Tuscaloosa, AL
- 2017 9th Meeting of the International Society of Zoological Sciences, Xining, China
- 2017 University of Oregon, Eugene, OR
- 2017 Gordon Research Conference on Plant-Herbivore Interactions, Ventura, CA
- 2017 University of Minnesota, Minneapolis, MN
- 2017 University of South Florida, Tampa, FL
- 2016 University of Pittsburgh, Pittsburgh, PA
- 2016 University of Alberta, Edmonton, AB
- 2016 University of Mississippi, Oxford, MS
- 2016 Austin Peay State University, Clarksville, TN
- 2015 Early Career Scientists Symposium – University of Michigan, Ann Arbor, MI
- 2014 Iowa State University, Ames, IA
- 2014 Workshop on Microbiology of Animals in the Built Environment – Univ. of California, Davis, CA

MENTORSHIP

Postdoctoral Researchers

Brian Trevelline Oct 2017 - present

Graduate Students

Samantha Fontaine September 2017 - present
Elizabeth Rudzki May 2019 - present

Undergraduates

Current - Dominique Tripoli, Maya Maurer, Anna Lackey, Tate Yawitz, Kendall Kohler, Matt Maier, Emily Lyons, Amanda Haid, Sarah Hartill, Sarah Reilly
Past - Yasmin McGowan, Julianne Newman, Chelsea Toner, Aaron Lauer, Samantha Neri, Drake Palmer, Julianne Conway

Service on PhD Committees

Veronica Iriart University of Pittsburgh (current)
Nevin Cullen University of Pittsburgh (current)
Veronica Saenz University of Pittsburgh (current)

Mae Berlow University of Tennessee – Knoxville (current)
Tess Stapleton University of Utah (current)

PROFESSIONAL SERVICE

- 2019 Organizing a Special Session at SICB honoring Dr. William Karasov
- 2018 Ad hoc reviewer for NSF – Division of Environmental Biology
- 2017 Organized a symposium on host-microbe interactions at annual meeting for Society for Integrative and Comparative Biology – <http://tinyurl.com/KohlSICB>
- 2016 Invited Speaker chair for “Inequality in Biosciences” group at Vanderbilt University
- 2016 Ad hoc reviewer for NSF – Division of Integrative Organismal Systems
- 2015 Review Editor for *Frontiers in Microbiology*
- 2015 Ad hoc reviewer for NSF – Division of Environmental Biology
- 2011-12 Chair of the Biology Graduate Student Advisory Committee
- 2009-11 Coordinated Biology Graduate Student research in progress seminar series
- 2010 Biology representative on ‘Science Day at the U’ organizational committee

Peer Reviewer - See my Publons profile at www.tinyurl.com/Kohlpublons